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SURVEYS
N. Rocky Mtn.

FOREST INSECT CONDITIONS

Northern Region

1969

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FOREST INSECT CONDITIONS
NORTHERN REGION - 1969

COVER PHOTOGRAPH: Pine looper adults (top = female; bottom = male).

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FOREST INSECT CONDITIONS
NORTHERN REGION - 1969

By

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INTRODUCTION

Each year surveys and evaluations are made of the major forest insect problems in the Northern Region to follow their patterns and predict their behavior in the future. Evaluations are made of factors that may influence insect population rise and decline. From these results we attempt to stay abreast of the current and future insect conditions.

Some of the surveys and evaluations conducted in Region 1 during 1969 are:

1. Aerial surveys to determine the extent of damage caused by different insects and locate new infestations.

2. Spruce budworm egg mass survey to predict defoliation the following year.

3. Larch casebearer parasite survey to determine native parasitism.

4. Evaluations to determine percent population buildup and spread of introduced larch casebearer parasite, Agathis pumila (Ratz.).

5. Larch casebearer perimeter survey to follow the spread of the infestation.

6. Cone and seed insect surveys to identify destructive insects and determine extent of their damage.

7. Bark beetle (mountain pine beetle, spruce beetle, Douglas-fir beetle, Ips) surveys to follow their activity.

8. Douglas-fir tussock moth survey to be alerted to new epidemics.

9. Balsam woolly aphid detection survey to insure detection of this pest as soon as it enters the Region.

10. A survey to determine atmospheric hydrogen fluoride accumulation in forest insects.

11. Miscellaneous surveys of insects of less importance (shoot moths, terminal weevils, pine butterfly, pine looper, etc.) are made to obtain information on extent and intensities of these pest populations.

It is from these surveys and evaluations that information is collected for the assemblage of this "Conditions Report."

CONDITIONS IN BRIEF

Generally, insect populations were at low levels in the Northern Region during 1969. Spruce budworm infestations ranging from light to very heavy occurred on more than 4.1 million acres of mixed fir, spruce, and pine types in Idaho and Montana. Defoliation continued to decrease east of the Continental Divide in Montana and increase west of the Divide. Larch casebearers spread into the Bob Marshall Wilderness Area which is the eastern limit of western larch type. One native parasite caused 50 percent reduction of larch casebearer populations at one site in Montana. Severe cold temperatures and predators and parasites reduced spruce beetle populations to low levels in the North Fork Flathead River, Flathead National Forest, Montana. Tree killing by mountain pine beetle increased in north Idaho and decreased in eastern Montana. The Douglas-fir beetle killed large volumes of Douglas-fir in eastern Washington, north Idaho, and in Montana. Tree killing by fir and pine engravers decreased in most areas of the Region. A pine looper caused severe defoliation of ponderosa pine near Lame Deer and Ashland, Montana.

No chemical control programs are planned for 1970.

STATUS OF INSECTS

Defoliators

WESTERN BUDWORM, Choristoneura occidentalis Freeman.[1/] The western budworm is no longer considered to be just a serious defoliator of spruce and firs but has more recently been blamed for serious defoliation of western larch and damage to Douglas-fir cones. Budworm larvae feed not only on the needles and cones of western larch, but more important is their feeding damage on the shoots of reproduction, causing "bushy" trees with multiple leaders. In areas of high budworm populations, they will destroy almost 100 percent of the Douglas-fir cones, even in years of heavy cone crops (fig. 1). Unlike most other cone and seed insects that are confined to a single cone throughout their development, a single budworm may destroy two or more cones during its larval period.

Budworm defoliation in the Region exceeded 4 million acres in 1969 for the second consecutive year. This is the second time in the past 9 years that defoliation has exceeded 4 million acres. The Lolo and Nezperce National Forests received the greatest amount of defoliation, suffering over 1½ million and 1 million acres defoliation respectively (table 1). Defoliation on the Nezperce was much more severe than on the Lolo. Over 257,000 acres were classified as heavily defoliated on the Nezperce, compared to 8,218 on the Lolo.

1/ Previously spruce budworm, C. fumiferana Clem.

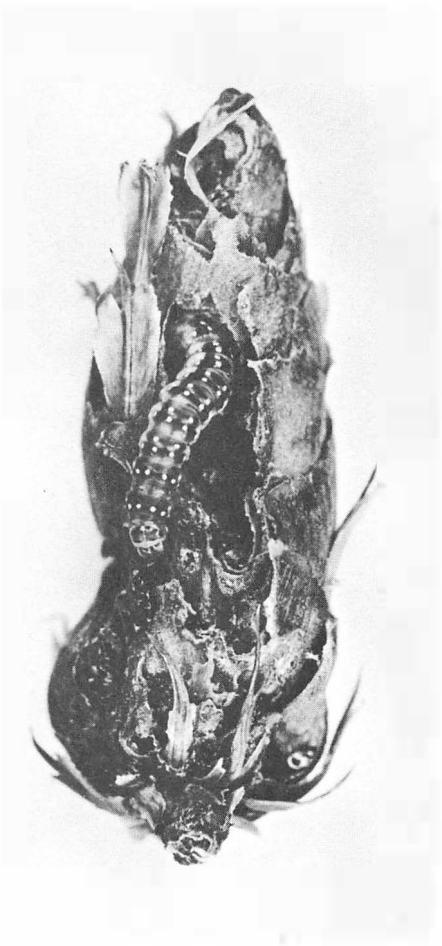


Figure 1.--Budworm damage to Douglas-fir cone.

Extensive winter burn and frost damage occurred in early spring and summer 1969. This caused some difficulty distinguishing between it and budworm defoliation during our aerial surveys, particularly on some eastside forests where winter damage was most evident. As a result, budworm defoliation acreages are considered somewhat conservative in some areas.

Since the early 1960's, the method of predicting budworm defoliation in the Region has been by evaluating the number of new egg masses from two 2,000-square-inch foliage samples collected from 25 permanent plots. The reliability of this prediction has not been satisfactory.

Table 1.--Acres of western budworm defoliation visible in 1969

Unit	Intensity of damage		Total
	Light & Moderate	Heavy	
Beaverhead NF	19,840	333	20,173
Bitterroot NF	372,429	11,238	383,667
Clearwater NF	289,766	4,378	294,144
Custer NF	11,315	--	11,315
Deerlodge NF	94,771	1,459	96,230
Flathead NF[1/]	119,373	--	119,373
Gallatin NF	55,398	3,354	58,752
Helena NF	367,155	7,373	374,528
Lewis and Clark NF[2/]	74,880	461	75,341
Lolo NF[2/]	1,546,342	8,218	1,554,560
Nezperce NF	751,206	257,178	1,008,384
St. Joe NF	15,514	--	15,514
Yellowstone NP	5,293	320	5,613
	3,723,282	294,312	4,017,594

1/ Includes adjacent Bureau of Indian Affairs land.

2/ Includes adjacent Bureau of Land Management land.

This past season three methods of predicting defoliation were evaluated. The methods were:

1. Same as previous years.

2. Same as previous years, except using 3 years' data in the analysis; i.e., 1967 egg mass count and 1968 defoliation, 1968 egg mass count and 1969 defoliation, and 1969 egg mass count to predict 1970 defoliation. A quadratic analysis with a series of regressions was used.

3. McKnight, et. al.[2/] sequential sampling plan.

All three methods of analysis predict a general decline in defoliation for 1970. Method one predicts a decrease in defoliation on 9 plots, an increase on 5 plots, with degree of defoliation unchanged on 11 plots. Method two predicts a decline on 12 plots, an increase on 3 plots, and 10 plots to remain about the same. Only 14 plots were sampled by method three, predicting 7 plots to decline in defoliation and 7 to remain static.

2/ McKnight, M. E., Donn B. Cahill, and Harold W. Flake. Sequential plan for western budworm egg mass surveys in the central and southern Rocky Mountains. Unpublished report, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 1968.

In general, it appears there will be a decline in overall defoliation in 1970. Heavy defoliation is expected in only a few areas.

Two areas, approximately 4,000 acres of mixed fir and spruce type each, were sprayed with Zectran on the Nezperce National Forest in 1969. Zectran was applied at the rate of 0.15 pound in a half gallon of carrier per acre in Fish Creek, and two treatments, 1 day apart, of 0.075 pound Zectran in half gallon of carrier per acre in Skookumchuck. Budworm population reduction averaged 66 percent in each area. This relatively poor mortality may be partially due to the droplets being too small to settle properly, or to the bud phenology of the multi-species stand causing some larvae to be less developed than others at spray day, or other unknown factors.

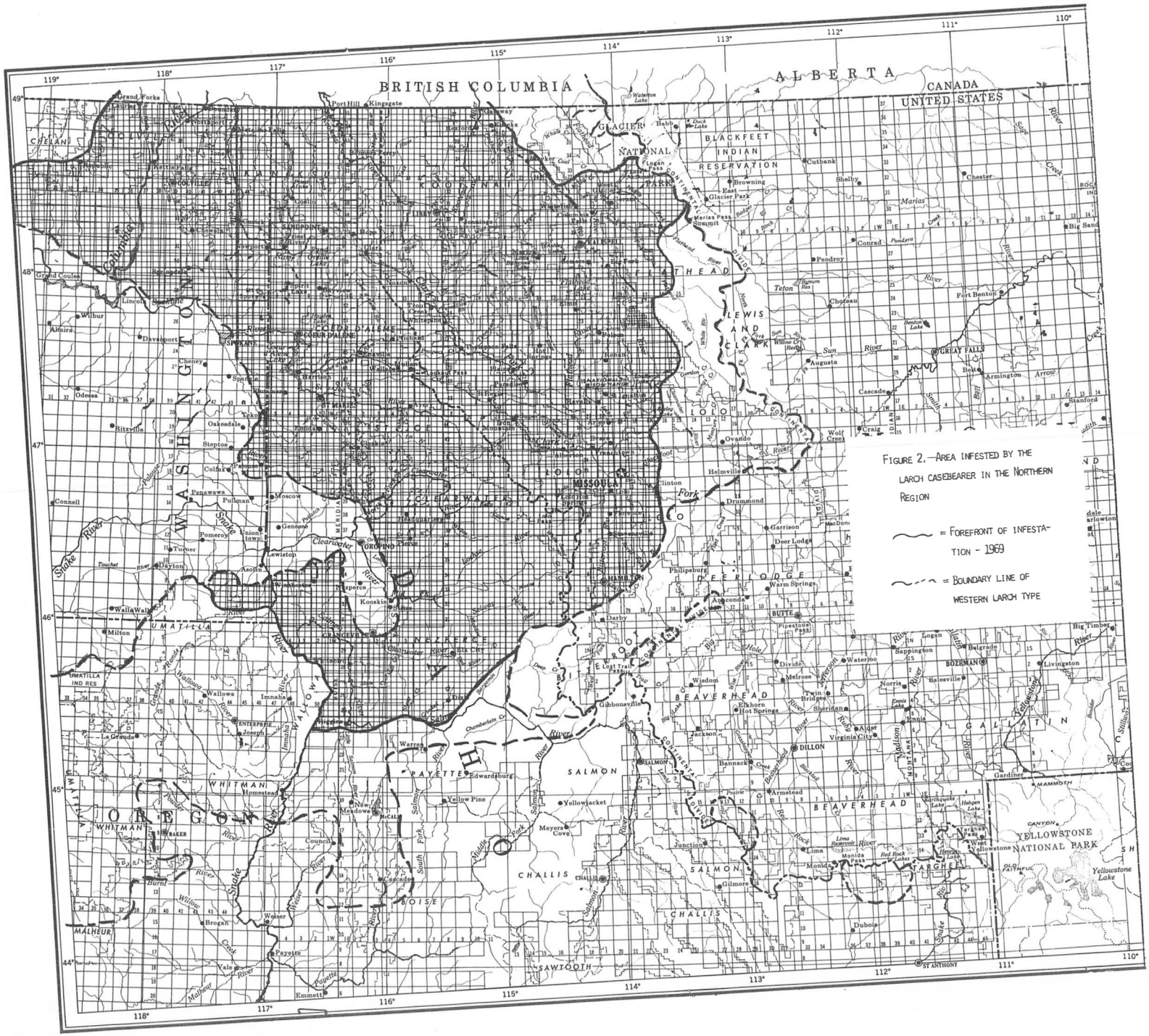
LARCH CASEBEARER, Coleophora laricella (Hbn.). Since first being detected in the Region in 1957 near St. Maries, Idaho, the larch casebearer has extended its range south to Riggins, Idaho; north into British Columbia; east into the Bob Marshall Wilderness Area in Montana; and west to eastern Okanogan County in Washington. This is a spread of approximately 140 air miles in each direction in 13 years (fig. 2). The area involved exceeds 48,000 square miles (includes farmlands, rangelands, and lakes). There are 7 million acres of larch type in the Region; of which over 90 percent is infested with larch casebearer. Casebearer populations have fluctuated in the past few years. In some areas, especially in Montana, populations have declined drastically. With the exception of the Flathead Lake area and along the Idaho border, most of Montana will have low populations. The Kaniksu and Coeur d'Alene Forests in Idaho will have high population levels. The Clearwater and St. Joe National Forests in Idaho, and Colville National Forest in Washington will have isolated spots of heavy defoliation in 1970. Damage varies from undiscernible to tree mortality in extreme cases.

About 50 acres of heavy casebearer damage were aerially photographed with True Color Ektachrome in a 70 mm. camera mounted in a helicopter and flown at about 250 feet above tree level near Trout Creek, Montana. The objective of this photography was to determine if varying intensities of casebearer damage could be detected on color photographs. It was found that severe damage was detectable. Other films and techniques will be used to determine if lighter damage levels can be observed.

A casebearer habitat evaluation conducted in 1969 showed a distinct correlation between casebearer population levels and elevation. Eighteen areas were sampled, and in all cases populations were very low at elevations over 4,000 feet and much higher at elevations of 2,500 to 3,500 feet.

Approximately 500,000 casebearer parasites were released at 100 locations in Washington, Idaho, and Montana in 1969. The method of release was by attaching branches containing many parasitized casebearer larvae to infested trees. About 50,000 parasites were sent to British Columbia.

Parasitism of the larch casebearer parasite evaluations in 1969 show that native parasites exist in fairly high numbers (fig. 3). Twelve species of parasites have been collected since 1968. Agathis pumila (Ratz.), the


BRITISH COLUMBIA
ALBERTA
CANADA
UNITED STATES
WASHINGTON
OREGON
IDAHO
MONTANA
FIGURE 2.—AREA INFESTED BY THE LARCH CASEBEARER IN THE NORTHERN REGION
= FOREFRONT OF INFESTATION - 1969
= BOUNDARY LINE OF WESTERN LARCH TYPE

introduced parasite, was recovered from four of the six release sites sampled. The highest percent parasitism by A. pumila was 19 at a 1964 release site near Hope, Idaho.

The most abundant parasite recovered was a chalcid, Dicladocerus near westwoodi (Westw.). It parasitized 43 percent of the casebearer in one collection, was found at 16 of the 20 areas sampled, and was more abundant in Montana than in Idaho.

Spilochalcis albifrons Walsh. was the most common parasite found in Idaho. It accounted for 24 percent parasitism in one collection.

Evaluations will continue in 1970.

Figure 3.--Larch casebearer parasites. From left to right--
A. pumila; D. near westwoodi; S. albifrons.

A LOOPER, Phaeoura mexicanaria Grote. About 25,000 acres of ponderosa pine were defoliated on the Custer National Forest and Northern Cheyenne Indian Reservation in eastern Montana. This is a new State record for this insect and the first report of it ever causing damage.

The larvae may exceed 2 inches in length (fig. 4) and completely destroy both the old and new foliage. They overwinter as pupa in the duff.

Figure 4.--Pine looper larva.

A variety of natural control agents is working on the infestation. Parasitized and diseased larvae were common. Of the 2,015 pupae collected, 680 (34%) were parasitized and 55 (3%) were malformed or diseased. At least three species of pupal parasites are present. Only two have been identified: Ichneumon pulcherior (Heinr.) (fig. 5) and Euphorocera sp. near edwardsii (Will.), possibly a new species. The most common parasite was I. pulcherior.

Diseased pupae were infected with a common insect fungus Paecilomyces farinosus.

Wild turkeys feed heavily on the pupae. The ground in some areas appears to have been raked due to turkey scratching.

Pupal counts showed from 0 to 17 pupae per square foot of duff sample, with an average of about 4. From this it appears the infestation will continue through 1970.

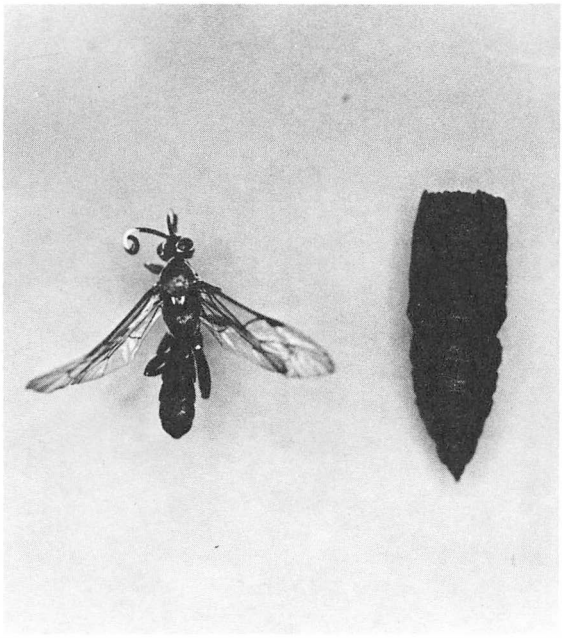


Figure 5.--I. pulcherior and looper pupal case from which it emerged.

PINE BUTTERFLY, Neophasia menapia Feld. Pine butterflies were at their highest level in many years. Pine stands on much of the Lolo and Bitterroot National Forests in Montana, and Nezperce National Forest in Idaho received the heaviest defoliation. Defoliation was not conspicuous, but by late August several hundred adults could be observed in flight around individual trees. Egg clusters were plentiful in the fall. Over 5,000 eggs were sent to the Insecticide Evaluation Project, Pacific Southwest Forest and Range Experiment Station, Berkeley, California, for insecticide screening.

All indications are that pine butterfly populations will be high in some areas in 1970.

MISCELLANEOUS DEFOLIATORS. Endemic populations of sugar pine tortrix, Choristoneura lambertiana (Busck.) Freeman; tent caterpillars, Malacosoma sp.; and larch sawflies, Pristiphora erichsonii (Htg.) persist in the western portions of the Region. The Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., and the pine tussock moth, Dasychira sp. populations remain at very low levels.

A sawfly, Pristiphora leechi Wong and Ross, was collected on larch by Intermountain Forest and Range Experiment Station entomologists on the Coeur d'Alene National Forest in Idaho. This is the first report of this insect in the Region since it was first collected in 1957. Defoliation was very minor and

extent of infestation is unknown. This and the larch sawfly are the only species of Pristiphora recorded on larch in western North America.

The fall webworm, Hyphantria cunea Drury, caused widespread defoliation upon a variety of deciduous trees.

Bark Beetles

ENGELMANN SPRUCE BEETLE, Dendroctonus obesus (Mann.) = (D. engelmanni Hopk.). Extreme spruce bark beetle tree killing observed in the North Fork Flathead River, Flathead NF, Montana, during the past 2 years has subsided due to natural factors. Extremely cold temperatures, predators and parasites reduced population averages from 200+ to 5 beetles per square foot of bark surface.

Tree killing was observed in Sullivan Creek drainage, Colville NF, Washington; Granite and Hughes Creeks, Kaniksu NF, Idaho; and throughout the South and Middle Forks Flathead River, and the Stillwater drainage, Montana. Approximately 400 trees were killed west of St. Maries Lake, Glacier National Park. Tree losses are expected to be low next year.

Approximately 150 windthrown infested spruce were treated with ethylene dibromide in the proposed Jewel Basin Scenic Area, Flathead NF. Cost of treatment averaged $45 per tree.

Other than logging infested and susceptible mature and overmature spruce trees, no control is planned for 1970.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae Hopk. = (D. monticolae Hopk.). The mountain pine beetle killed approximately 100 MMBF of western white pine on about 5,000 acres in Lightning Creek, Kaniksu NF, Idaho. About 1,000 acres of mixed lodgepole and ponderosa pine are very heavily infested on State, private, and Lolo NF land near St. Regis, Montana. Logging-for-control is planned for both areas during 1970.

Endemic infestations are present in ponderosa pine in the Big and Little Snowy Mountains, on Bureau of Land Management lands, and on the Lewis and Clark NF near Lewistown, Montana.

About 400 infested ponderosa pine were sprayed with ethylene dibromide to clean up an infestation on Monarch Mountain, Belt Creek Ranger District, Lewis and Clark NF. Infestations in lodgepole pine continue to decline on the Yaak District, Kootenai NF, Montana.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae Hopk. Serious drought conditions during 1966-67 caused a general weakening and decline of vigor of Douglas-fir, resulting in heavy 1968 attacks by Douglas-fir beetles. Large volumes of Douglas-fir trees were killed on the Colville NF, Washington; along the Lochsa River, Clearwater NF, Idaho; on the east-facing slopes of the Salmon River from

Whitebird south to Riggins, Idaho; and throughout portions of the Bitterroot, Lolo, Flathead, and Lewis and Clark Forests, Montana.

Extensive salvage sales are in progress to remove dead timber.

Continued drought conditions may result in increased beetle activity in some areas during 1970.

PINE ENGRAVER, Ips pini (Say.). Pine engraver beetles caused top kill of mature trees and infested patches of pole sized ponderosa pine on the Nezperce and Coeur d'Alene Forests, Idaho, and on the Bitterroot, Lolo, and Flathead Forests, Montana. Most outbreaks occurred adjacent to logging, thinning, or road construction areas. Populations are expected to remain at the same level in 1970.

FIR ENGRAVER, Scolytus ventralis Lec. Outbreaks of this bark beetle declined in 1969. Light infestations occurred in scattered small groups of grand fir on the Nezperce, St. Joe, and Coeur d'Alene Forests, Idaho. The downward trend will probably continue next year.

Other Insect Problems

ENGELMANN SPRUCE WEEVIL, Pissodes engelmanni Hopk. This insect continues to persist wherever there is significant spruce regeneration in the Region. It is responsible for much top kill and crown deformation in some plantations. The Flathead and Kootenai National Forests in Montana are the most severely affected.

LODGEPOLE NEEDLE MINER, Recurvaria sp. A needle miner in lodgepole pine is quite common in Glacier National Park and the Flathead National Forest in Montana. Damage has been minimal.

SEQUOIA PITCH MOTH, Vespamima sequoia (Hy. Edw.). Pitch moths can be found throughout the Region in ponderosa and lodgepole pines. Excessive injury has not been observed.

PINE SHOOT MOTH, Eucosma sp. The pine shoot moth infestation in the Joe Springs ponderosa pine plantation on the Nezperce National Forest in Idaho continued through 1969, but at a reduced level from 1968. Considerable injury to the shoots of ponderosa reproduction in that area has been observed for the past 3 years.

OTHER INSECTS of lesser importance active in the Region include the western pine tip moth, Rhyacionia frustrana bushnelli (Busck.), the pine needle scale, Phenacaspis pinifoliae (Fitch), and the Cooley spruce gall aphid, Chermes cooleyi Gill.

Special Evaluations

FLUORIDE SURVEY. An evaluation was initiated to determine accumulations of atmospheric hydrogen fluoride on insect populations. This study is being conducted on the Flathead National Forest and Glacier National Park in Montana. Fluoride is emitted as a byproduct from an aluminum reduction plant in Columbia Falls, Montana. Emphasis is being placed on evaluating insect population buildups in areas of excessive fluoride levels. Insect tissue is also being analyzed for accumulation of fluoride. This survey is only a segment of a coordinated study involving plant pathologists, hydrologists, soil scientists, meteorologists, wildlife biologists, and range specialists.

BALSAM WOOLLY APHID SURVEY, Chermes piceae (Ratz.). A detection survey was conducted to check for the presence of the balsam woolly aphid in the Region. Special attention was given nurseries along the Idaho-Washington border, and along the Canadian border. This insect has not been reported in the Region to date.